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Short-Term Forecasting of Severe Convective Storms by Using Satellite Retrieved Cloud Microstructure

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Severe convective storms are characterized by strong updrafts, caused by the combination of instability and wind shear. The intensity of the updrafts can be revealed by satellite observations of cloud top temperature (T) and indicated particle effective radius (Re) of the tops of the growing convective towers in developing storms. The hydrometeors have less time to develop in stronger updrafts, hence rendering Re smaller. Therefore, slower growth of Re with decreasing T is indicative of greater vigor of the storm. Observations of T-Re relations from geostationary satellites allow early detection of hail and tornadic storms. A computerized algorithm for automated early alerts of the severe convective storms showed a substantial skill in predicting the storms with a lead time of two hours. The methodology was operationally tested successfully at the Severe Storms Prediction Center in the USA during the spring of 2008. The methodology was also tested on several case studies over Europe with the METEOSAT-8 geostationary satellite in validated cases of damaging hail storms, and shows similar or better potential compared to the application in the USA, due to the better quality of the METEOSAT-8 as compared to the GOES satellites.
This opens a whole new concept of using the multispectral capabilities of the METEOSAT Second Generation for identification of clouds that have the potential to become severe convective storms. The physical principle, methodology and results of the operational tests will be shown.